1: Underhill E-5 (1931-1935)1946 NU28 Papago NU28

the notch at the top of the stick and tied around the neck of the stick with another string. Under certain circumstances turkey down replaced eagle down, but the feathers of no other birds were used.

At the harvest ceremony all prayer sticks were painted blue (the Zuni color for men). After the salt gathering at Santa Rosa they were painted both blue and yellow. Occasionally a stick two feet long was "planted" in behalf of a group. This was done at the prayer-stick festival at Quitovaca, where the stick was painted with a red spiral, and by the salt gatherers from Akchin, who tied a red cloth around it.

Though there was a word for bird down, there was no word for prayer stick, which was simply called "sacred object," as were the fetishes.

Deer tails were as desirable as eagle down for accompanying a fetish. The scalp basket unpacked by the writer contained four of them. They should be, if possible, from the black-tailed deer, the white-tailed variety having "no power." Tails from a deer ritually killed were important ceremonial objects, used at the cleansing ceremony and in curing "deer sickness." However, the tail of any deer formed a valuable offering, and hunters did a thriving trade in them.

Tobacco was offered in the form of cane cigarettes; their ceremonial name was "reed joint." Each consisted of a section of *Phragmites communis*, three or four inches long and filled with *Nicotiana attenuata*, the variety grown by the Papago. If no reeds were obtainable, corn husks were used as cigarette wrappers. Cigarettes were always smoked before being deposited, the votary taking four puffs, in the four directions, then stating his wish.

Beads, usually of turquoise, were a less common offering, but highly valued. The request for offerings made in behalf of one village fetish ran: "Bring your valuable things, eagle down, deer tails, and beads."

Certain occasions demanded the use of corn meal, which must be made of "flatheaded corn" (two ears growing together so that each had one flat side).[1] Such meal was most lavishly used at the prayer-stick festival, and it is significant that Navitcu, the cere-

[1] Cf. Mason, 1918, p. 22.

1: Underhill E-5 (1931-1935)1946 NU28 Papago NU28

monial clown of this occasion, is said to have taught the Papago to summon him at other times by placing corn meal in his hand. They invite all workers for the festival in this way, and, moreover, special officials make a corn meal "road" for the dancers in the Pueblo manner. Officials also sprinkle corn meal on all who enter the ceremonial enclosure, and at least once on all the inhabitants of every participating village. Corn meal is also used on other occasions. Holding a pinch of it in the hand is the method for summoning the shaman and the curing singer, and it is strewn on the ocean by the salt pilgrims.

PURIFICATION

All who took part in a ceremony, or at least the important officiants, observed continence, fasted, and finally took a cold bath to remove the supernatural influence. Cold water was the accepted Papago method of purification. It was obtained by allowing water to stand in the wind in a porous jar, thus being cooled by evaporation. A burdensome duty of the women folk belonging to any ceremonialist was the fetching of fresh water and making a new porous jar.

Fasting was raised by the Papago to extreme importance. During food ceremonies the officiants abstained from meat, grease, and salt in the Pueblo manner, but the power ceremonies demanded self-denial amounting almost to starvation. One may conjecture that these Spartan measures required as much endurance as did the running demanded of visionaries. They served the practical purpose of fitting a youth for the rigorous life of a desert hunter and warrior. Women also fasted and ran, though to a lesser degree. It would seem that the Desert People, in whose lives food and running were recurrent necessities, had elevated these prosaic needs to ceremonial virtues.

Blowing tobacco smoke upon someone was a milder form of purification. It was used by the shaman to cure illness and also by those who purified a man who had been in contact with supernatural power. In the old rituals blowing tobacco smoke is a form of prayer which placed a man in contact with the supernatural.

3: Underhill E-5 (1931-1935) 1936
NU28 Papago NU28

mother. My father asked him to sing over me to see what was the matter. He sang all night, and in the morning he said: "You could be a medicine woman." "That cannot be," said my father. "We have one medicine man in the house and it is enough." So the medicine man said he would take out my crystals. He leaned over me and sucked them out of my breast, one by one. They were as long as the joint of my little finger, white and moving a little. He said: "Look, I have taken them out before they got big." Then he made a hole in a giant cactus and put them inside. Then he looked at me and said: "They will grow again, for it is a gift."

159x 787

IV

In the summer everyone came home to our village and we planted corn. The corn was once a man and he lured a woman away to sleep with him. She stayed a long time, and when she came home, she knew the songs that made the corn grow. So when the men all went to their meeting, this man did not go but he stayed at home hearing his wife sing. The men from the meeting came to speak to him. "Why are you absent?" "Because I am listening to my wife." "How can it be that a man can learn more from a woman than from talking with us? Let us hear her, too."

159x 243 [533]

So she came to the men's meeting and she sat between the chief and her husband. "Sing." And she sang the corn songs.

At the first song those men began to sing. At the second, they danced. At the third, the women came out of the houses, creeping to the council house to listen to the singing. At the fourth, they were all dancing, inside the council house and outside, to that woman's singing.

We sang those songs as we put the corn into the earth, but it was the men who sang, for women do not do those things now. We stood ready with the corn kernels while the men sang, then we went down the field together, each woman behind a man. The man dropped his stick into the soft earth, thud! As deep as my hand is long. The woman dropped in four corn kernels and scraped her bare toes over that red earth to cover them.

Then the corn came up. The fair stalks, the thick root, the broad leaves.

> I saw the tassels waving in the wind
> And I whistled softly for joy.

[533]

My father used to sing that at night while the corn was growing.

I used to like it in the summer time when all our friends and relatives were around us. The houses were scattered all over the flat land; round brush houses like ours. In every house there were women grinding corn,

361 342

3: Underhill E-5 (1931-1935) 1936
NU28 Papago NU28

159 and down by the wash there were men bending over the fields where the 243 corn and beans and squash were growing.

[523] In the furrow
At the corner
The corn is growing green
Growing green.

I used to hear those songs coming from the houses, because we were so happy in summer time. We had rain. Every morning the sky was bright and every afternoon the little white cloud stood over the mountains to the east. Everywhere by the washes you saw the centipedes that are a sign of [825] rain. We call them a blessing, those centipedes. There were so many that [823] you could shake your head and, pff! one would fall out of your hair. Now there are no more. That fine weather is gone.

159 We women did not have to fetch water. We could sit in the house and 579 make baskets. Or else we could go off over the land to pick the fine fresh 721 green things. At sunset all the village was full of laughing people, eating around their home fires.

Then we heard the crier call: "Come hither! Bring your cigarettes. We will smoke and talk of what we shall do!"

That call was for the men, not for the women. They got up from the fires and we saw them passing in the starlight against the gray desert that looks almost white on summer nights. I know what my father used to say to them in that meeting, for he has often told me how they spoke after the cigarette went round.

"Well! will you be ready? Take care, for often I have warned you. You must make arrows and your bow you must have in readiness, for when the enemy will arrive, you do not know. At night he may come; at night or in the morning or when the sun stands anywhere in the sky. Then you will arise, your bow you will snatch and therewith will fight the enemy.

"Close by you must keep your bow, your quiver, your hardwood arrows, and your reed arrows with the stone tip. Early in the morning must you have your food that you may be able to fight the enemy. Your girls very early must cook and must give food to the youths that they may be strong to fight no matter where the sun stands in the sky. Your girls shall pour water and shall search for wood and shall cook food. Early in the morning your girls shall run that when the enemy shall come, they can run swiftly and can save their lives.

"This I feel and this I say. Listen and my words shall enter your ears and enter your heads."

5: Castetter & Bell N-5 (1938-1940) 1942
NU28 Papago NU28
Pima NU29

The following information on the several crops is based upon numerous collections made in the field among Papago and Pima by the authors, as well as upon other field collections made by Ruth M. Underhill among the Papago. Determinations of types were made by the authors except as otherwise indicated. All lots have been deposited in the Laboratory of Biology at the University of New Mexico.

As regards maize, the following were secured:

White soft	thirty collections,	several hundred ears
Yellow soft	five collections,	fifteen ears
Purple soft	three collections	eight ears
Red soft	three collections,	nine ears
White flint	two collections,	two ears
Yellow flint	three collections,	four ears
Pop corn	two collections,	several hundred grains
Sweet corn	two collections,	several hundred grains

In the twenty collections of brown and twenty-two of white tepary beans were found occasional seeds of other tepary types. There were three lots of pinto beans, four of common pink beans, three of common red or Colorado, four common yellow kidney beans, five of lima beans, six of cowpeas; also three collections of chick peas and two of lentils.

Twenty lots of seeds of cheese pumpkin, eighteen of cushaw pumpkin and one of *Cucurbita Pepo*, as well as six of gourds, were made; also eight collections of watermelon and seven of muskmelon seeds.

As to tobacco, we have three collections of plants of *Nicotiana trigonophylla*, and one of *N. attenuata*; one of seeds of *N. tabacum* and two of seeds of *N. rustica*.

Our collections include three separate lots of *Martynia louisiana*.

Maize

Maize was cultivated by the Hohokam,[21] who preceded the Pimans in the Gila Basin, and there are also archaeological specimens from sites on the fringes of the Piman area, such as Tonto Cave, Canyon Creek Ruin and sites on the

[21] Haury, in Gladwin *et al*, *Excavations at Snaketown*, I, 158.

5: Castetter & Bell N-5 (1938-1940 1942
NU28 Papago NU28
Pima NU29

upper Gila River (see Chapter III). Although it has been thoroughly established by documentary material, dating from the close of the seventeenth and beginning of the eighteenth century, that the Pima-Papago grew maize aboriginally,[22] neither archaeology nor the early documentary material gives any indication of the types. Thus we have only ethnographic studies, in reality tradition, to inform us as to ancient types of maize. All our informants agreed that the ancient Pima-Papago corns were of a single type, namely flour corn.

This flour corn of early times was of three distinct colors—white, yellow and blue—the white most common, yellow next. Red flour corn was occasionally seen but was not regarded as a standard sort. Ears of all four colors as grown by these Indians today are slender and only slightly tapering, rarely more than seven inches in length, and extending from about one and one-half inches in diameter at the butt to about one and one-fourth inches at the tip. The cob is regularly circular in cross section rather than elliptical as in some of the Southwestern corn, particularly archaeological specimens. Generally the ears are twelve-rowed, but occasionally ten or fourteen, and in rare cases eight, with grains wedge shaped and usually medium in size. No particular difference was observed in size of ear or grain among the several colored corns of either Papago or Pima, and all informants stated any variation was dependent upon conditions of cultivation rather than being "in the blood." For example, ears seen in Kohatk village in 1939 were of large diameter with very large grains, which the owner attributed to the abundance of water during that season. On the other hand, all ears seen at Vamori village in 1939 were quite slender and small grained, and we were informed that corn in this village is regularly small-eared because of poor soil.

A number of samples of flour maize, secured from differ-

[22] Mange, *op. cit.*, pp. 215, 217, 230, 247, 249, 250, 256; Bolton, *Kino*, I, 187, 195, 248, 291; II, 207.

5: Castetter & Bell N-5 (1938-1940) 1942
NU28 Papago NU28
Pima NU29

ent parts of the Pima and Papago reservations, were grown under irrigation on the Conservancy District Agricultural Experiment Substation farm just south of Albuquerque, in the Rio Grande Valley, during the summers of 1938 and 1939. As might be expected, when compared with each other these showed considerable variation in characteristics such as height of plant, time of flowering, time of maturity, size of ear, number of rows of kernels, color of anthers etc. In other words, different samples showed a great amount of genetic diversity and revealed that corn grown on different parts of these reservations, and even by different individuals in the same village, by no means displayed complete genetic unity.

The ears of Pima corn observed, all of which were grown under irrigation, were no larger-eared or larger-grained, on the average, than were Papago ears, nor were the largest Pima ears larger than the largest Papago ears found. This was true for the corn grown on these reservations as well as that of Pima and Papago origin grown at Albuquerque. It is interesting to note that all of this Pima and Papago corn (as well as all other Indian corn secured from the Maricopa and Colorado River tribes) planted on this plot in Albuquerque grew and gained height more rapidly than did Mexican June corn grown from certified seed on the same plot. All the Indian corn outgrew the Mexican June until mid-July when the latter began to outstrip the Indian corn in height. The above seed corn was planted May 10, 1938, and May 12, 1939.

Unless the flow of water in the Gila was abundant, often the heavy irrigation preliminary to planting was all the water that the soft native Pima varieties received. Since they flowered in from fifty to sixty days after planting, they made comparatively little demand upon irrigation water. Some of our informants spoke of "sixty-day corn." This undoubtedly had reference to time from planting to flowering rather than to time of maturity. Spier[28] wrote that the Havasupai grew

[28] Spier, *Havasupai Ethnography*, p. 103.

5: Castetter & Bell N-5 (1938-1940 1942
NU28 Papago NU28
Pima NU29

a very small variety of starchy maize, known as Mohave corn, which yielded ears in two months, and Forde,[34] writing of the Yuma, stated "The main spring crop is yellow corn which will ripen in two months." Although the native Pima and Papago corns produce silks and tassels within fifty to sixty days after planting, our field studies consistently have failed to reveal any variety of corn among Pima, Papago, Yuma, Mohave and Cocopa which matured in this length of time. As ordinarily grown by the Pima these soft native varieties seldom yield more than ten to twelve bushels per acre; when grown by the U. S. Field Station at Sacaton they yielded twenty to twenty-five bushels. Sacaton June, a variety developed by the Field Station, yielded fifty to sixty bushels with moderate culture.

1. *White starchy maize.* Both tribes formerly grew a single variety of white corn. This was a solid white ear, both grains and cob being white, the grains having a colorless pericarp and colorless floury *(fl)*[35] endosperm.

2. *Purple starchy maize.* A single variety of purple corn was formerly grown by both tribes. This was a white-cobbed, solid purple ear with colorless pericarp and floury endosperm with purple aleurone *(A C R Pr i)*. The shade of purple varied from light blue to a blue-black, and these tribes recognized that such variation in shade may be due in part to climatic conditions and degree of maturity. However, there is also doubtless an intensifier factor *(in)* operating on this purple aleurone to give the several shades.

Neither tribe attempted to grow a mottled or speckled blue and white variety, but occasionally an ear with a few such mottled grains or even an entire mottled ear was seen.

3. *Yellow starchy maize.* The Pima and Papago grew a single variety of yellow corn. This had colorless pericarp, a yellow starchy endosperm and all ears observed had white

[34] Forde, *Ethnography of the Yuma Indians*, pp. 109-11.
[35] The symbols herein used designate hereditary factors.

5: Castetter & Bell N-5 (1938-1940) 1942
NU28 Papago NU28
Pima NU29

cobs. It seems to have been grown less extensively than were the white and blue sorts, however. Informant Gerónimo said his grandfather grew only the white and blue varieties, never any yellow corn, and was firm in his opinion that the Papago in the Big Fields village never grew ears of solid yellow corn in that day. Occasionally a few yellow grains would appear on ears of white maize, and it was considered that this is how the yellow-grained variety originated. Several informants advised that Indians of the Altar Valley in Sonora grew this yellow variety rather commonly in the early days.

4. *Red starchy maize.* Both tribes anciently had a single type of red flour corn, a solid red ear although variable in shade, the grains having red pericarp and colorless aleurone and endosperm proper. Two Pima informants maintained that Pima red corn in early days was a deep color with no varying shades. Although red ears of maize are rarely seen on either reservation now, we have succeeded in finding a number among the Papago. The pericarp color ranges through shades from pink to dark red, seeming to represent several genes of the *Pp* series of alleles. Our investigations failed to reveal a single ear with red or brown aleurone. All red ears seen had white cobs.

Red corn was considered a novelty, rarely planted, and was therefore never regarded as a specific variety. Informants said it would come out of the regular white which was planted and therefore was seen only occasionally. Gerónimo said that as a boy he never saw solid ears of any shade of red corn, but that streaks of pink affecting parts of one or more rows were sometimes seen on otherwise solid ears.

Occasionally ears with variegated pericarp would appear, and were called laughing or prostitute corn. The grains of such ears were variously striped with white, cream or light yellow and shades of red or orange. Informants explained it was called laughing corn because the grains look as if they were smiling, or prostitute corn because of the bright colors

5: Castetter & Bell N-5 (1938-1940 1942
NU28 Papago NV28
Pima NV29

Pi Pa 243 of the grain. Such ears were not abundant, being found only in plantings of white flour corn; it was never planted as a separate variety.

Of the four colors of starchy corn mentioned above, only the white is seen commonly today. The next most frequent is yellow, with blue and red sorts rarely seen; this holds for both Papago and Pima.

The only satisfactory explanation found for the almost complete disappearance of some of these colored corns is that they now sell some of their corn to traders, and the only types for which there is any commercial demand are the native soft white, and American varieties which have in part supplanted the colored Indian sorts. Informants agreed that the blue and yellow corns are just as good food as the white, and can be prepared in all the ways that the white one is used, thus no explanation is forthcoming on the basis of taste preference. Nor is the explanation to be found in ceremony.

5. *Flint corn.* All our Pima and Papago informants were of the opinion that flint corn was not Indian corn, but of Mexican origin, and had come into their area comparatively recently. Both tribes grow it to some extent today and it does well. Bernabé López said that when he was a boy the Papago went down into Sonora to work for hire and brought flint corn home. Within the past forty years certain Papagos have been growing a large, flat-grained, white, flint corn, but this is recognized as of definitely Mexican origin. Also the Pima grow a hard, flinty, yellow variety now known as Santan Yellow, accepted in some quarters as an aboriginal variety.

Pa 243 6. *Pop corn.* The line of demarcation between flint and pop corns is not sharp. When the ears have but eight to ten rows and the endosperm is composed chiefly of hard starch they are called flints; small-seeded, multiple-rowed corn having this same type of stored starch in the grain is classed as pop.

We secured from the Papago two kinds of pop corn. The first was a mixture of grains which evidently had come from

5: Castetter & Bell N-5 (1938-1940) 1942
NU28 Papago NV28

different ears. All the grains had yellow endosperm and colorless aleurone, some had colorless, others red, pericarp, while the glumes indicated part had come from ears with red, part from those with white cob. The second specimen was a somewhat smaller pop corn than the preceding, with yellow endosperm, the grains having either colorless or colored aleurone. This sample, too, apparently came from more than one ear, as the pericarps were of two kinds, red and colorless. The glumes revealed that the cobs from which the red grains came was red, that bearing the yellow grains, white.

Papago informants said the tribe has had pop corn for only about forty years and that it was originally obtained from the Mexicans.

7. *Sweet corn.* A single type of sweet corn was procured from the Papago. The sample was sent for examination to J. H. Kempton, Botanist for the Division of Cereal Crops and Diseases of the U. S. Bureau of Plant Industry. He reported that it is a many-rowed yellow true sweet *(su)* corn, restricted, to the best of his knowledge, to the Papago, and that it closely resembles one which he obtained near Sells a number of years ago. It does not compare with our modern selected sweet corns in quality, and in his opinion represents a mutation to the sugary condition that took place in a multiple-rowed flint corn. He has never seen sweet corn among the Pima, Maricopa or lower Colorado tribes. We found no sweet corn among the Pima.

All our Papago and Pima informants, save one, agreed that sweet corn was not one of the ancient Papago sorts, but that it had been introduced comparatively recently from Mexico. Several of the Papago informants had seen it grown in the Altar Valley when on expeditions to Sonora years ago. The single exception was a Papago informant, Chico Bailey, a very reliable old man at Pisinemo village, who said sweet corn was very old among the Papago—just as old as any

5: Castetter & Bell N-5 (1938-1940 1942
NU28 Papago NU28

243 Papago variety. In this connection Kempton[26] informed us that when a certain Papago Indian visited in Washington, D. C., some years ago, he was pleased to see that the Bureau of Plant Industry had in its collection the sweet type of corn from his tribe, and said his father told him the Papago had always grown it.

The fact that Chico Bailey regarded sweet corn as ancient among the Papago may be understandable when we consider that, having been born in Mexico, he was often in close contact with the Papago and Soba of that region, who, for some time, have grown sweet corn; and that other informants dwelling much farther north on the reservation and not in close contact with the Indians of Mexico, had never seen or heard of it.

That sweet corn is even now rarely found among the Papago is indicated by the fact that one informant said he had never seen anything like our specimens of sweet corn, that it was not corn at all, but a freak.

Archaeological specimens of sweet corn in the Southwest, in fact in the Americas, are extremely rare, the only recorded ones for the Southwest being the Pueblo III ear secured by Morris[27] at the Aztec Ruin and a single grain obtained from the excavation of the Jemez cave,[28] both in New Mexico. Also, the writers have seen at the Arizona State Museum, in Tucson, a few grains of purple sweet corn, considered as prehistoric but not dated, secured in Cummings' excavations at Gourd Cave, Nitsie Canyon, northern Arizona. In this connection, we are indebted to Dr. Emil Haury for permission to make reference to this specimen (no. 1935).

Similarly, ethnological data on the occurrence of sweet corn in the Southwest are rare. It has been reported only for the Hopi.[29] In our own field studies it has been found at the

[26] J. H. Kempton, Personal correspondence, Jan. 23, 1940.
[27] Erwin, *A Rare Specimen of Zea Mays.*
[28] Alexander and Reiter, *Report on the Excavation of Jemez Cave*, pp. 61-2.
[29] Whiting, *Ethnobotany of the Hopi*, pp. 69-70.

5: Castetter & Bell N-5 (1938-1940) 1942
NU28 Papago NV28
Pima NV29

Zuñi, Acoma, Laguna and San Felipe Pueblos. Although informants among each of these four Indian groups maintained that the cultivation of sweet corn was ancient, more objective evidence is needed to establish its antiquity among these pueblos.

Thus it would seem that sweet corn, commonly regarded as resulting from a mutation to the sugary endosperm from a flint corn, was not widely, if at all, cultivated in the Southwest aboriginally. Hence it is most unlikely the Pima-Papago grew it before the coming of the Spaniards, and up to the present no one has been able to ascertain when they did begin to cultivate it. The only historic mention of sweet corn among the Papago or Pima is that of Freeman.[30]

While visiting Papago villages in southern Arizona in 1910, Freeman found a number of grains of sweet corn, "wrinkled sweet grains," on ears of what he called the "true, southwestern Indian or Squaw corn [flour corn]." There were originally two types of grains of sweet corn secured from these ears. He referred to the first as flinty pop corn, with small ears and extremely hard shallow grains. The other type had larger ears, deeper grains and seemed to be sweeter than the first. Both, when grown, showed considerable variation as to type and productivity. From these, Freeman developed, by crossing and selection, a variety which he designated Papago sweet corn. However, it has not been a success in Arizona due to poor yield and low sugar content.

8. *Dent corn.* Regular dent corn, such as our commercial types, was wholly unknown to both tribes until quite recently, and many individuals have never seen it. Semi-dented ears were often seen but the denting was always regarded as due to immaturity of the ears.

9. *"Flathead corn,"* that is, ears that are flattened and sometimes split at the tip, when encountered in husking are laid aside to be used later. This corn is never planted. Young

[30] Freeman, *Papago Sweet Corn*, pp. 454-56.

5: Castetter & Bell N-5 (1938-1940 1942
NU28 Papago NU2P
Pima NU29

Pi Pa 243

people must not eat such ears, although there is no restriction upon old people doing so; if a young woman eats such corn her next baby may be flatheaded; if a boy eats it he may become flatheaded.

Flatheaded corn has considerable significance, and the Papago "think something great about it." It is ground into ceremonial meal and used only on certain occasions. In the important Papago practice of making the ceremonial expedition to bring salt from the Gulf of Mexico, Papago men must take some of this meal and sprinkle it in the Gulf before removing salt or anything else produced in the water. Also, at the harvest dance ceremonial cornmeal was sprinkled on the ground in front of the singers. Or, it was held in the hand as an offering when a ceremonial favor was requested.

At present the Papago grow chiefly flour and dent corns, with small amounts of flint and sweet varieties. Twenty years ago the best corn for growing to maturity in the Pima territory was Sacaton June, a strain of the Laguna variety developed by the Coöperative Testing Station at Sacaton; at least as late as 1930 it continued to be superior to any of the Pima native varieties tested. Tests made at this station showed that Sacaton June yielded forty to fifty bushels per acre with moderate care while the soft Pima corn yielded about sixteen bushels. Those Pimas who had access to pump water found Sacaton June well suited to their farming practices, since they were able to mature a crop of maize following the harvesting of their wheat. Although some of the Pimas who depended entirely upon summer flood water from the Gila were able to secure good yields from Sacaton June, most of those who did not have access to pump water planted only native Indian varieties.[21] Recently the Indian Extension Service has been encouraging the planting of increased amounts of Mexican June, the acreage of native types con-

[21] King and Loomis, *op. cit.*, p. 50; King, *op. cit.*, pp. 16-17.

5: Castetter & Bell N-5 (1938-1940) 1942
NU28 Papago NV28
Pima NV29

sequently being reduced. Nevertheless, the Pima still grow from three to five hundred acres of the native types, these plantings consisting of Pima soft white, Pima soft yellow, Pima soft blue, and Santan Yellow which is a hard flinty sort. The soft Pima varieties are not only popular for domestic use but have met with favor in some of the markets of the Salt River Valley. Many of the Pimas are able to secure substantial yields of both the native Pima soft kinds and Santan Yellow flint because of the short period required for maturing and low water requirement, only one irrigation being necessary. Development for the Pima, by the Field Station, of a sweet corn with relative freedom from corn earworm damage, has proved to be quite difficult.

Beans

Our investigations among the Pima-Papago reveal that they are now growing three species of beans: teparies *(Phaseolus acutifolius)*, kidney beans *(P. vulgaris)* and lima beans *(P. lunatus)*.[82] However, the relative antiquity of the three among these Indians is difficult to determine. Although Fewkes[83] reported finding beans (and maize) in an excavated room east of Casa Grande, an edifice occupied jointly by Hohokam and Pueblo peoples, a letter from J. E. Graf, of the Smithsonian Institution, where Fewkes' material is located, advises that neither the beans nor the maize mentioned are in the Smithsonian collections.

Kino, Mange and Velarde,[84] who visited Pimería Alta while both peoples were still on an aboriginal level, made frequent but indefinite reference to their growing *frijoles*. It is impossible to draw any conclusion regarding the kind or kinds of beans involved, and perhaps the best way to clarify

[82] For seed and vegetative differentia of the three species the reader is referred to: Bailey, *Manual of Cultivated Plants*; Hardenburg, *Bean Culture*; Piper, *American Phaseolineae*; Freeman, *Southwestern Beans and Teparies*.

[83] Fewkes, *Casa Grande*, p. 150.

[84] Bolton, *Kino*, I, 187, 195, 291; II, 207; Mange, *Luz*, pp. 217, 247-50, 256; Wyllys, *Velarde's Relación*, p. 128.

5: Castetter & Bell N-5 (1938-1940 1942
NU28 Papago NU28
Pima NU29

Wheat and Barley

There is indication that wheat, which in some places had kept ahead of the frontier of Spanish settlement, had been received from the south by the Pimans of the Gila Basin before Kino's arrival in Pimería Alta in 1687.[116] Of all the Old World crops introduced among the Pimans, wheat has been of most importance in their economy. This is especially so because it came as an off-season crop, ripening in May when the fall harvest of maize, teparies and pumpkins was exhausted, and before the giant cactus harvest.

Kino himself distributed considerable wheat seed among the Pimans, and it is clear that the Pima quickly began to cultivate it in such quantity that it soon replaced maize as their leading crop. Anza,[117] writing of a Pima village on the Gila in 1774, said their fields of wheat were so large that "standing in the middle of them, one cannot see the ends, because they are so long. Their width is also great, embracing the whole width of the valley on either side . . ." Although this picture is unquestionably exaggerated, that they did grow large amounts of wheat is substantiated by Garcés. In 1858, the first year of the Overland Mail Route, a 100,000-pound surplus crop of Pima wheat was purchased by the Overland Company; in 1859, the Pima sold 250,000 pounds; in 1860, 400,000; in 1861, 300,000 pounds and in 1862 about 1,000,000 pounds to the Federal Government for use of troops operating in their territory.[118] The great quantities of wheat obtainable in the Pima country are repeatedly mentioned by the California-bound forty-niners and this was one reason for using Maricopa Wells, etc., as the jumping-off point to the Colorado. Russell[119] observed forty years ago that wheat was the principal Pima crop, in wet seasons the harvest amounting to several million pounds. In 1919 more than

[116] Bolton: *op. cit.*, I, 263; *Rim of Christendom*, p. 248.
[117] Bolton, *Anza*, I, 184; II, 240, 304; Coues, *op. cit.*, p. 107.
[118] Browne, *Adventures in the Apache Country*, p. 110.
[119] Russell, *Pima*, pp. 76, 90.

5: Castetter & Bell N-5 (1938-1940) 1942
NU28 Papago NU28
Pima NU29

twenty-five carloads of wheat were sold by the Pima, in addition to the quantity they consumed.[120] The Papago, however, did not bring wheat into general use until they came in contact with it in Mexico several generations ago while working there seasonally for hire. One reason for this may be that, until government wells were dug, these Indians were not able to live in the flats in cool weather, when wheat should be planted. Lumholtz,[121] writing in 1912, said it was then the most important Papago crop. On the basis of acreage, wheat continued to hold the leading place among Pima and Papago crops until at least 1924. Today it ranks second among both peoples. The growing of wheat has been established for so long a time that most of our Pima and Papago informants regarded it as an aboriginal crop, and said reference to wheat appears in their creation legends.

Definite data on types of wheat grown in our area are given by Hendry,[122] who studied the vegetal content of adobe bricks from buildings erected during the mission period. He found seeds of Propo wheat (*Triticum vulgare graecum* Kcke.) and of Little Club wheat (*T. compactum Humboldtii* Kcke.) in adobe bricks at San Cayetano del Tumacácori, in southern Arizona, founded in 1701, and at San Valentín, in northwest Sonora, founded in 1706; also California Club wheat (*T. compactum erinaceum* Kcke.) at San Valentín, in southern Arizona, founded in 1706. Hendry states that Propo wheat was found at twelve of the fourteen structures examined in southern Arizona, Sonora, Lower California and California and that it seems to have been the most extensively grown variety throughout the region during the Spanish and Mexican periods. The specimens found are uniform in type and appear to be identical with the variety as known in California today. The California Club wheat found does not correspond exactly with any of the present day club varieties

[120] King and Leding, *Agricultural Investigations*, pp. 5, 29.
[121] Lumholtz, *New Trails*, p. 25.
[122] Hendry, *The Adobe Brick as a Historical Source*.

5: Castetter & Bell N-5 (1938-1940 1942
NU28 Papago NU28
Pima NU29

and is thought to be the bearded, red-chaffed, club wheat reported by Davis[123] as having been grown in California at the time of the American occupation, and then known as California Club.

Russell,[124] who worked among the Pima in 1901-02, states they were then growing four varieties of wheat, Sonora and Australian being favorites. Twenty years ago the leading varieties were Early Baart, Sonora and Little Club,[125] and at present Early Baart, Sonora and Club comprise the bulk of wheat grown by the Pima. Sonora wheat is very drought resistant, although it makes an inferior bread flour because of the low percentage and poor quality of albumen. It is a beardless winter variety with round, very soft, white grains used largely in making such foods as tortillas. Club wheat resembles Sonora in that it is beardless and has soft white grains.

A few fields of black-bearded, hard wheat with amber-colored grain (*T. durum*), and Polish wheat (*T. polonicum*), a form with long, large spikes and kernels, locally erroneously called macaroni wheat, are to be seen at present among the Pima; the growing of these species seems to date back about thirty years. Arizona Baart, a soft, white-grained, bearded variety, covers by far the largest Pima wheat acreage, since this is the principal variety grown by the white settlers and seed is therefore readily available. As grown in the Gila and Salt river valleys, it is superior to other varieties in the same class in yield and bread making. The Sonora variety is still grown on a small acreage by the Pima; its yield is about equal to Early Baart but it is poorer in quality.

Although Sonora wheat continues to hold first place among the Papago, some individuals grow Early Baart. In exhibits at the Papago Fair, held every fall at Sells, Arizona, there is pure Sonora wheat, Early Baart, and many mixtures.

[123] Davis, *California Breadstuffs*, p. 518.
[124] Russell, *loc. cit.*
[125] King and Leding, *op. cit.*, p. 25.

5: Castetter & Bell N-5 (1938-1940) 1942
NU28 Papago NU28
Pima NU29

A few Indians have exhibited hard wheat (*Triticum durum*). Neither Papago nor Pima have grown, nor grow at present, any spring wheat to speak of, although the Papago particularly are often forced to plant late in winter because of delayed winter rains, and by no means harvest a crop every year. However, yields as high as twenty-five bushels per acre have been harvested at times, and a good crop may supply sufficient wheat to last for several years. Thus Chico Bailey, a Papago informant, asserted that the best yield he ever had was one hundred sacks of wheat and twenty of barley. This fed his family for three years. Farm advisors discourage Pima plantings after mid-January. The importance of wheat in Piman economy is attributable to the fact that, in addition to being an off-season crop, it usually can be grown successfully with the moisture from the winter rains, perhaps supplemented among the Pima by one or two irrigations from river water during winter or spring freshets. Being a winter crop, wheat can often be grown successfully in the Gila Valley on soils of higher salinity than most summer crops would tolerate.

Barley, too, was cultivated by the Pimans soon after Kino's entrance into the area. In 1870 the Pima and Maricopa[126] on the Gila had issued to them ten thousand pounds of barley seed by the Federal Government. The Papago at San Xavier were reported in 1898 as very successfully growing barley for hay; in fact it was more lucrative than any other crop. Wheat and barley were the leading crops at San Xavier between 1904 and 1908. The same report for 1899-1900[127] states that barley cut for hay at this same place yielded two and one-half tons per acre, and was a more profitable crop than wheat.

Hendry[128] found in adobe bricks from the mission of San Cayetano del Tumacácori seeds of Coast barley (*Hor-*

[126] *Report of the Commissioner of Indian Affairs* for 1871, p. 350.

[127] *Ibid.* for 1898, p. 118; *ibid.* for 1899, p. 165; *ibid.* for 1904, p. 148; Curtis, *The North American Indian*, II, 31.

[128] Hendry, *op. cit.*, p. 113.

5: Castetter & Bell N-5 (1938-1940 1942
NU28 Papago NU28
Pima NU29

deum vulgare pallidum typica Ser.). This is identical in type with the now widely grown variety of that name. The fact that it was found in twelve of the fourteen structures studied in Sonora, Lower California, California and southern Arizona, indicates a widespread culture in the region.

At present the Pima-Papago grow two varieties of barley, Common and Vaughn. The latter, a smooth-awned sort, is characterized by its consistently high yield and stiff straw. At the irrigated area of San Xavier the leading Papago crop is barley, harvested mostly for hay. Among the Pima and Papago barley is usually planted from November to January, although sometimes as late as February, and is grown almost entirely for pasturing cattle; this begins about six weeks after the crop is planted. Early sown barley, as well as wheat, sometimes has been reported as damaged by late frosts at San Xavier and on the Gila.

Watermelons and Muskmelons

Of the Old World crops introduced among the Pimans, watermelons originally ranked very high in importance. That their cultivation in places preceded Kino's arrival is clearly shown by the fact that in the fall of 1698 he encountered a group of Papagos at the village of San Angelo del Bótum (present day Cocklebur) who were growing watermelons, "although never in that village or in the others of this vicinity and coast had there entered another white face or Spaniard."[129] The culture of watermelons long since has become so thoroughly established among the Pimans that all our informants regarded them as aboriginal.

The significance of watermelons in Piman economy may be attributed to two things: their extreme fondness for them, and the fact that they may be stored until well into winter. Russell,[130] in 1902, observed that watermelons were among the most important crops of the Pima, who ate them at least

[129] Bolton, *Rim of Christendom*, pp. 397, 400-01.
[130] Russell, *op. cit.*, p. 75.

5: Castetter & Bell N-5 (1938-1940 1942
NU28 Papago NU28
Pima NU29

work, as was the cultivation and harvesting. Plants were quite drought resistant.

Only the white-seeded form was grown, as its pods had longer, finer-grained and deeper black strips of epidermal tissue, and therefore more suitable for use in basketry. They were planted in hills about six feet apart with four or five seeds to the hill, in holes about six inches deep, although the seeds were covered to a depth of only two inches.

Pods were gathered as they matured, about the time maize was ripening, but all must be gathered before frost to prevent the black color of the pod from fading. Fruits were ready to harvest when the dry epidermis peeled off readily. The ripe pods were gathered and laid out in piles in the field to dry, and informants said they had seen their mothers spread wood ashes over such piles. When thoroughly dry the pods were hooked together to form large clumps or balls, and stored in a rain-proof building, since weathering affected their color.

Before removing the strips of epidermis for use in basketry, the pods were buried in moistened ground over night to facilitate the stripping. However, more recently some merely plunge the pods in boiling water to aid in removing this tissue. These strips were tied in bundles and stored in baskets or ollas. The process of preparing and utilizing *Martynia* in basketry has been discussed in detail by Kissell.[17]

Seeds of the unicorn plant were sometimes eaten but were of little importance as food. They were removed from the pods at the time the strands of epidermis were stripped, and were dried and stored in a small sealed olla.

Wheat

Time of Harvest

Pima and Papago planted wheat any time from November to February, and harvested in May or early June. However, late sowings usually produced small plants and a poor yield.

[17] Kissell, *Basketry of the Papago and Pima*, p. 202.

5: Castetter & Bell N-5 (1938-1940) 1942
NU28 Papago NU28
Pima NU29

Informants said the best crop was obtained when planted about the first of January, as there was then little danger from frost injury when plants were coming into head in April. However, at the Sacaton Experiment Station, November plantings of the principal varieties of wheat for twenty-two years usually have given higher yields than later plantings, and in only two seasons did they suffer any freezing damage after heading. At present it is customary for the Pima to turn cattle into the fields to pasture on the green wheat plants, then irrigate in January, after which the wheat tillers well (puts forth new shoots around the base of the original stalk) and is ready to harvest about the last week in May. Barley can be pastured three or four times and still give a crop, wheat only once, so it is considered superior to wheat for this purpose. Both are first pastured when about a foot high. Pima like to plant their barley in late October and harvest in late May, as there is little danger of frost damage to this crop.

As indicated in an earlier chapter, until recent years large numbers of Papago visited the Gila Pima to take part in the wheat harvest, and the Pima paid them for their labor in wheat. Informants reported that some Pimas became so dependent on the Papago harvest help that the wheat crop would shatter from overripeness if their special Papago families were late in arriving or failed to come at all.

Method of Harvest

Harvesting wheat was usually done by both men and women working together, and reciprocal help at wheat harvest was formerly quite common. If a relative or friend assisted in planting he was given only his meals during the period of his labor, but if he helped with harvest he was invariably given a share of the crop. Since the same spot was used for threshing year after year, the threshing floor was repaired before cutting the crop. For such a floor, a low dike was thrown around an area about thirty-five feet in

5: Castetter & Bell N-5 (1938-1940 1942
NU28 Papago NU28
Pima NU29

diameter which did not flood in time of heavy rain and where the soil would cake. All weeds were removed and the ground flooded, or at least moistened, and allowed to dry out until hard enough to support the weight of a man without making depressions in the soil. It was then tamped by foot, or, in later days, with poles four feet high and about four inches thick at the base, or blocks of wood each bearing a handle. A stout pole ten to fifteen feet tall was erected in the center of the prepared area. Among the Papago the threshing floor belonged to the patriarchal family in common.

When wheat was first grown, in early Spanish days, the plants were pulled out by the roots in harvesting; later they were cut off just above the ground with a knife made of ironwood, or with a sickle. This was ordinarily done by both men and women.

Formerly wheat was not sowed as thickly as at present. While this held for the days when it was planted in hills and later in rows, it also applied to broadcast sowing, hence the crop was not as large per given area as at present. There was no selection of seed wheat. Grain to be planted was simply taken out of the general supply used for food.

Threshing

Regardless of how wheat was harvested, it was placed in small piles to be gathered up, usually by women, and carried —formerly in burden baskets, later in a cotton cloth or on their heads—to the threshing floor. At present these piles are gathered and hauled by wagon. Formerly there was no central pole and the wheat was placed on the floor in small piles, allowed to dry several days; then women trampled the grain by foot or threshed it with ocotillo poles, about five feet long and one and one-half inches thick, first beating each pile, then removing the coarser straw, and flailing again. More recently, the wheat has been piled on the threshing floor and leveled. Then three or four horses were tied abreast, with the inside animal tied to the pole by a long rope. A

5: Castetter & Bell N-5 (1938-1940) 1942
NU28 Papago NU28
Pima NU29

person mounted on another horse, or at times afoot, drove the animals around and over the wheat continuously for seven or eight hours, thus trampling out the grain. One man kept the wheat raked evenly over the floor.

When the task of threshing had been completed, a certain amount of winnowing was done by throwing the straw into the air, formerly by hand, then with improvised forks, and later with steel ones. Women, on their hands and knees, used branches of creosote bush for brushing up, gathering and carrying the coarse straw from the floor. Formerly most of this was burned although a small amount of the straw was saved for making baskets, etc. Small amounts of wheat, too green to be included in the general threshing, were put to one side, allowed to dry further, and flailed later.

Winnowing and Storing

Women then gathered the remaining grain and chaff into shallow winnowing baskets, about three feet across, held them at arm's length in the air and allowed the contents to fall gradually to the ground, the wind meanwhile blowing away the chaff. The grain was then placed in cotton cloths (later in sacks) and carried to the house for further winnowing on some windy day by dropping it from shallow baskets on to sotol mats or cotton cloths. The wheat was finally dried on these mats in the sun for two or three days, remaining bits of straw picked out by hand, then stored in baskets three or four feet high, usually made of grass after the fashion described under the storing of maize. The average Papago family had a crop of about two bushels.

Utilization of Wheat

When flour was needed the grain was pounded in a wooden mortar with a stone pestle, after being softened with a little water. At present, the grain, before being ground into flour on the metate, is dried thoroughly in the sun, then shaken in a basket until the hulls are blown away.

Papago informants said often in earlier days food was

7: Lumholtz N-5 (1909-1910) 1912
NU28 Papago NU28

only more shallow. On the rocks were pictographs of the same kind and design as may be seen elsewhere in the district, as, for instance, near Caborca. Turkey vultures have a breeding place on the top; according to my guide, who has seen the young here, these birds make no nests.

Inside of the houses of the Indians in these parts, I often noticed skins of the peccary, called in Mexico *javalin*, the meat of which is much relished by the Papagoes; also skins of the mountain-sheep, deer, and lynx were seen. The Papagoes are exceedingly fond of meat. One day at La Nariz a young steer was killed. Generous parts of the carcass were distributed to those who had helped to butcher it, and everybody in the afternoon, including ourselves, was invited to come and "eat meat." The meat was broiled on coals, each person preparing his portion for himself, and this feasting was kept up until eleven o'clock that night. The participants actually arose earlier than usual, long before sunrise, to broil more meat and continue the banquet. Nothing else was consumed, not even tortillas, and in the afternoon very little of the beast was left.

At the so-called Temporalés, where Mexicans from Sonoita and Quitovac practise dry farming, besides the usual forms of Indian corn, a kind of maize that matures in about two months is cultivated. It is called *maiz de los Yumas*, is white in color, and the ears are small. I saw some that had been planted in the beginning of August and which was ripe by the middle of October. The rains rarely fall here before August. Frost usually appears the 1st or 2d of November. This year it came on November

7: Lumholtz N-5 (1909-1910)1912
NU28 Papago NU28

243 14, and sometimes it comes as early as the middle of October. However, frost does not injure maize that has reached maturity.

361 Before proceeding to Sonoita, which is only twenty-three miles from here, I made a trip south to Quitovac, where I expected to find mail-matter awaiting me. There used to be some gold mining here, but the houses that make up the only street are now mostly abandoned. Two or three Mexican families live there and a small store is maintained. The main population consists of Indians, who live all around, some of them being possessors of cattle and a few having small fields. It grew dark before we arrived, and while we were arranging our camp in the quiet evening a young Indian rode up like a whirlwind as fast as his horse could gallop, stopping as suddenly as he had appeared. This is the Mexican way of "showing off" or making oneself conspicuous, and was distinctly discouraging to one who was looking for primitive people. My two kodaks were lying on the ground and miraculously escaped his horse's hoofs.

312 The principal attraction of Quitovac is the sufficiency of water which at all times oozes forth in various small springs at the edge of the low mesa, so-called. The latter is a deposit of calcareous matter which a quarter of a mile wide stretches behind the houses for a mile and a half in the general direction from north-west to south-east. Fossil remains have been found here, as well as at a ranch, Represa, five leagues east, where in making a dam some large animal was encountered five feet below the surface. Also at Bánori and other places "bones of giants" have

17:Castetter & Underhill N,E-5 (1931-1934) 1935
NU28 Papago NU28

241 174 "At least one variety of the common kidney bean, pole bean, bunch bean, etc., was known to the natives before the advent of the Spaniards."

241 Teparies and frijoles are still planted at the beginning of the rainy season in holes three feet apart and six inches deep. When harvested the vines are laid on the ground and the beans threshed out with a stick; or if a very large crop, it may be threshed with horses, as is wheat. The threshed [251] beans are dried on the ground or roof and stored in jars. Vetch *(Vicia* sp.), lentils *(Lens esculenta)* and chick peas or garabanzos *(Cicer arietinum)*, all of which have been introduced, are planted in February with the wheat and harvested like wheat in May, but otherwise are treated like beans.

CORN *(Zea mays)*

[262] 241 Red corn ---------- *si-wihpiki huhnyi*
White corn ---------- *to:ta huhnyi*
1. large grains
2. small grains

Yellow corn ---------- *s'uam huhnyi*
1. small, irregular grains, like popcorn
2. large grains, soft
3. a modern variety, attributed to the Navajo

Blue corn ---------- *s'tciata'ki huhnyi*
1. small, regular grains
2. large, irregular grains *(ku:pi)*

Crazy corn, grains of all colors ---------- *tcihpawi huhnyi*
Laughing corn, mixed red and white, large grains ---------- *hihihmi huhnyi*

All these varieties are mentioned in Papago planting songs but at present the only ones commonly found are yellow and white. Gifford (13) mentions both a yellow and white and a white soft maize, also a flint maize, grown by the Cocopa under the Papago name of *huhnyi* (corn) and credited to the Papagos.

The different colored corn grains were stored and planted separately and never allowed to mix. When har- [251] vested the grains might be removed from the cob with a

17:Castetter & Underhill N.E-5 (1931-1934) 1935
NU28 Papago NU28

stone scraper, then parched and dried on a mat on the roof, or whole ears might be roasted. In this case a fire was made in an open pit and the ears thrown in on the hot coals when it had burned down. Two women turned the ears with green mesquite sticks *(Prosopis velutina)*, allowing them to roast for several minutes and throwing them out on a bed of grass. These roasted ears were dried and beaten to remove the grains, which were then winnowed and stored in a basket to be ground into meal when needed; they were also cooked whole with meat.

Corn, like the other aboriginal staples, squash and beans, was planted with an invocation, and the ceremonies centered around it as the most important crop. There are songs for every stage of its progress: leaf appearing, stalk growing high, ear forming, and tassel forming. Almost all ceremonial orations, even those for war and for averting evil, end with an account of the ideal good fortune—a fine crop of corn. In another of the important cermonials, the fetching of salt from the Gulf of Mexico, the salt was always called corn and procuring plenty of it augured a good crop. Ceremonial use was made of cornmeal as was the custom among the pueblos. With the Papagos this meal had to be made of "flatheaded corn," generally twin ears, the juxtaposed sides of which were flattened. No attempt was made to raise such ears—they were simply saved as they occurred.

Freeman (12) isolated a race of native corn, which he designated Papago sweet corn, from grains obtained from the Papago Indians of southern Arizona. He originally secured two types which he crossed, and from this eventually developed the strain of Papago sweet corn. This, however, has not been entirely successful since it contains little sugar and is not a good yielder.

17:Castetter & Underhill N.E-5 (1931-1934) 1935
NU28 Papago NU28

Tobacco was planted in March and the planter would choose a place at the mouth of a small wash, out of sight of all the other fields, for tobacco had to be grown in secret. As soon as the plants were up creosote bush branches *(Covillea glutinosa)* were stuck in the ground to shade them. No one but the planter must now visit the patch or the plants would become shy and sink into the earth again. If a menstruating woman were to see them they would shrivel up and die.

No hoeing or transplanting was done but merely earth heaped around the roots now and then. A fence of mesquite posts *(Prosopis veluntina)* with thorny cholla cactus *(Opuntia* sp.) between protected them from marauding animals, and a ditch dug from the wash to the patch conducted any possible rain water. The creosote bush shelter was left until the plants grew up and touched it. When the tobacco was ripe the leaves were pinched off and spread on a mat outside the house to dry, although they were considered ready for smoking when about half dried, still green and very bitter.

COTTON

Cotton, *to'ki (Gossypium* sp.)

The early Spanish accounts refer to cotton as being grown, not only by the Gila Pimas (10), but by the Sobaipuris on the San Pedro (27) and by the people of San Xavier (10) (who were not the present residents). Little mention is made of the growing of cotton by the desert people, but informants thought a little was grown in favored places. No particulars of its culture were obtained. Cottonseed flour made very good browned cakes when baked on hot sand.

WHEAT

Wheat, *pi:rkanyi (Triticum aestivum)*

Wheat seeds were given away profusely by Kino at the end of the seventeenth century. Most Papagos, however, say they did not take over its general use until two or three

243 generations ago, when they learned more about it in Mexico. Many old people knew no flour in their youth, save that from wild seeds. One reason for this may be that until government wells were dug in the flats they were not able to live there in the cool weather when wheat should be planted.

At present most families raise enough wheat for their own use, planting in February and harvesting in May. After the field is plowed, wheat is planted by hand and the ground then harrowed. Occasionally the planter mixes his seed wheat with ashes and scatters the two together (7). The method of harvesting is that used in Spain in the seventeenth century, and consists in cutting the wheat with a scythe or sickle, then threshing it on a threshing floor—a circular patch of hardened ground, belonging to the patriarchal family in common.

When wheat is to be threshed three horses are hitched abreast, the inner one tethered by a long rope to the pole, and are driven round and round to trample the grain. One man walks behind and drives them, while one keeps the wheat stalks raked evenly over the threshing floor.

For winnowing the people wait for a windy day, then place the grain in large winnowing baskets about three feet
251 across and toss them until the chaff is blown away. Wheat is stored in grass granaries three or four feet high and about four feet in diameter (7). When flour is needed the
[252] grains are softened with water and pounded in a mortar with a stone pestle. The grain is now dried on the roof in the sun and then shaken in baskets until the hulls are blown away. Most of the wheat used by the Papagos is ground with the metate and mano, although some of it is now ground on the grinding mill.

~~243~~ The Papagos cultivate chiefly Sonora wheat *(Triticum aestivum)* which is very drought resistant. They use it for making their native breads, but it does not make a good leavened bread on account of is low percentage and poor

17:Castetter & Underhill N.E-5 (1931-1934) 1935
NU28 Papago NU28

quality of albumen. At present some of the more progressive Papagos are growing *Early Baart* wheat which was introduced some years ago by the University of Arizona and is now quite generally cultivated in the state. 243